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(11) Publication number:

0 595 077 A1

(12)

## EUROPEAN PATENT APPLICATION

(21) Application number: 93116129.3

(51) Int. Cl. 5: F22B 1/28

(22) Date of filing: 06.10.93

(30) Priority: 30.10.92 IT MI920948 U

(43) Date of publication of application:  
04.05.94 Bulletin 94/18

(84) Designated Contracting States:  
CH DE ES FR IT LI

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### (54) High-efficiency device for vapor production.

(57) The high-efficiency device for vapor production comprises a boiler (2) which is provided with a means (3) for heating a preset amount of water to form steam, with a means (4) for controlling the forming of steam and with a means (5) for the

controlled dispensing of steam, by means of flexible hoses (7), to the body of the iron (6); the boiler is connected to a means (8) for storing water and steam to replenish water and steam in the boiler in proportion to their consumption by the iron.

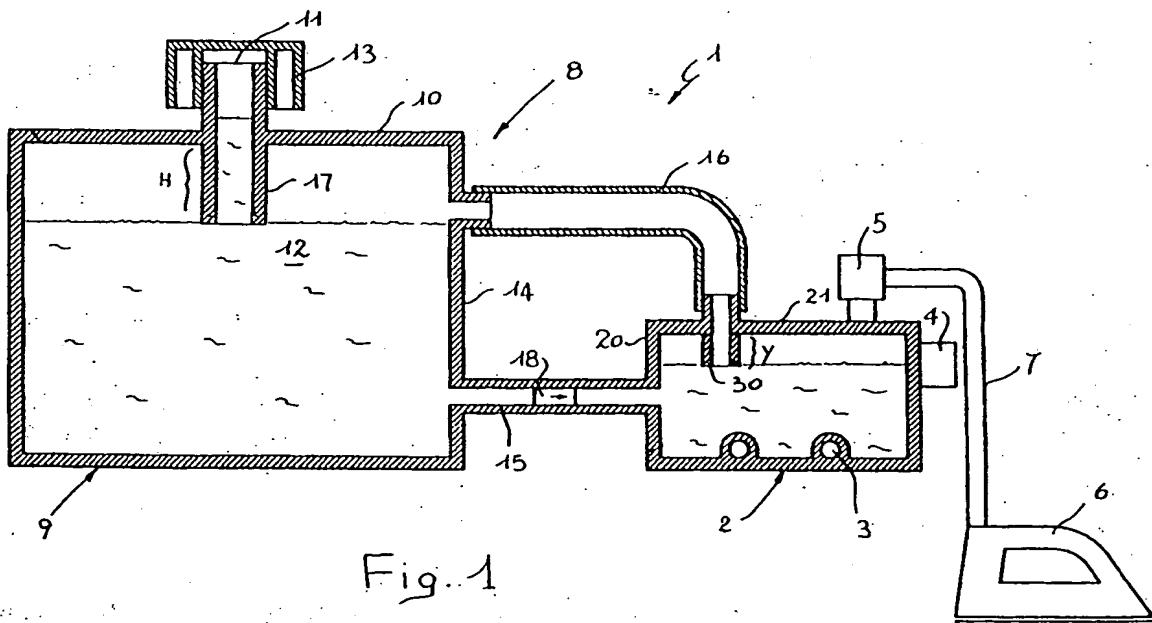


Fig. 1

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The present invention relates to a high-efficiency device for vapor production.

As is known, current ironing or cleaning machines include a boiler which is normally provided with one or more resistors for superheating the water which it contains and thus generating a large amount of steam.

The steam passes from the boiler, through for example a manually controllable electric valve, into one or more flexible hoses for conveying the steam for example to an iron or to a cleaning machines, from of which the steam flows out in a preset amount.

It is thus evident that the boiler of an ironing or cleaning machine must contain a considerable amount of water in order to be able to ensure the production of a large amount of steam as well as sufficient endurance, so that the user can iron or clean a plurality of articles without having to interrupt his work to replenish inside the boiler the amount of water used.

From the above it can be easily understood that in order to produce steam from a conventional boiler it is necessary to heat a considerable amount of water, with a consequent considerable consumption of electric power and a considerable waste of time while waiting for steam to be produced.

The above described situation obviously occurs both when the boiler is started and every time the water consumed is replenished inside the boiler.

The aim of the present invention is to eliminate the drawbacks of conventional ironing machines.

Within the scope of this aim, an important object of the invention is to provide a high-efficiency device for vapor production which, for an equal consumption of electric power, has an extremely reduced steam production time with respect to a conventional device for vapor production.

Another object of the present invention is to provide a device for vapor production which, while maintaining the reduction in the time required to produce steam, has an extremely long endurance in operation.

A further object of the present invention is to provide a device for vapor production which clearly has a lower energy consumption if the time required to produce steam is the same as that of a conventional device for vapor production.

Another object of the invention is to provide a device for vapor production which achieves high efficiency without using, for this purpose, expensive electromechanical devices except those which are already present in a conventional ironing or cleaning machine.

This aim, these objects and others are achieved by a high-efficiency device for vapor pro-

duction, which includes a boiler provided with a means for heating a selected amount of water in order to form steam, with a means for controlling the forming of the steam and with a means for the controlled dispensing of the steam, by means of flexible hoses, to a delivery body characterized in that the boiler is connected to a means for the storage of water and steam for replenishing the water and steam in the boiler in proportion to their consumption by said delivery body.

Further characteristics and advantages will become apparent from the detailed description of a high-efficiency device for vapor production according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic sectional side view for example of a high-efficiency ironing machine according to the invention;

Figure 2 is a view of the ironing machine of Figure 1, in the boiler of which steam has been produced; and

Figure 3 shows that as steam gradually flows out of the iron, steam is automatically replenished in the boiler according to the invention.

With reference to the above described figures, the high-efficiency device for vapor production according to the invention, generally designated by the reference numeral 1, includes a boiler 2 which is provided with a heating means and in particular, for example, with a resistor 3 which is arranged at its base and with a means 4 for controlling the forming of steam, such as for example conventional control devices such as thermostats and/or manostats.

In an upward region, the boiler 2 is furthermore provided with a means 5 for the controlled dispensing of the steam, such as for example an electric valve which can be controlled manually to transfer steam from the boiler for example to an iron 6 and from the iron onto the fabric to be ironed by means of flexible hoses 7. Conveniently, the boiler 2 is connected to a means for storing water and steam, generally designated by the reference numeral 8, which is suitable to replenish water and steam inside the boiler 2 in proportion to the consumption of the steam which flows out of the delivery body which in said example is an iron 6 but can be also a cleaning body and so on.

In particular, the storage means 8 includes a pressurized tank 9 which has an opening 11 suitable to allow the insertion of water 12 inside the tank.

Obviously, the opening 11 is provided with a closure and safety plug 13.

The pressurized tank 9 furthermore has a first duct and a second duct, respectively designated by the reference numerals 15 and 16, which are

connected to the boiler 2.

In particular, the first duct 15 extends from a wall 14 which is directed toward the boiler 2.

The opening 11 is formed by a pipe 17 which extends inside the pressurized tank 9 by an extent "H", so as to prevent the complete filling of the pressurized tank 9 by forming an air pocket for the accumulation of steam, as explained more clearly hereinafter.

The inlet of the second duct 16, which can extend both from the upper wall 10 and from the side wall 14, must always be connected to the air pocket.

The first duct 15 is instead provided with a one-way valve 18 which allows the water in the pressurized tank 9 to flow into the boiler 2 but prevents the return of the water into the pressurized tank 9 once a preset pressure has been reached in the boiler 2.

The first duct is arranged at a lower level than the second duct 16 and is connected to the boiler 2 substantially in a lower portion of its side wall 20.

The second duct 16 is instead connected to the boiler 2 on its upper wall 21 and extends inside the boiler for an extent "Y", so as to prevent the complete filling of the boiler, once again forming an air pocket for the accumulation of steam inside the boiler.

As shown in the drawings, it can be seen that the boiler 2, wherein water is superheated to form steam, is extremely small, in order to have an extremely short steam production time for an equal electric power consumption with respect to a boiler of a conventional ironing or cleaning machine.

In particular, tests which have been conducted have shown that while it takes approximately 10 minutes in a conventional ironing or cleaning machine to obtain the dispensing of steam, with the device for vapor production according to the invention this time can be reduced to less than one third.

This can be obtained by virtue of the particular structure of the above described boiler, the operation of which will be specified more clearly hereinafter.

By introducing water in the opening 11 and thus inside the pressurized tank 9, the water flows into the boiler 2 by means of the duct 15 and of the one-way valve 18 in open position.

The maximum level of the water inside the pressurized tank 9 is substantially slightly higher than the outlet of the pipe 17.

In fact, when fresh water is introduced, it tends to flow out of the opening 11 without substantially varying the maximum level of the water inside the tank 9.

At the same time, the level of the water inside the boiler substantially rises, due to well-known

laws of physics, to a level slightly higher than the outlet 30 of the duct 16.

At this point the boiler is ready to be started.

Then, by means of the resistor 3, the water inside the boiler 2 is superheated and steam production begins.

As mentioned, due to the small size of the boiler 2, the time required to produce steam inside it is extremely short.

When the pressure inside the boiler 2 reaches a preset value, the one-way valve 18 closes and part of the water flows, together with the steam, from the boiler 2 into the pressurized tank 9 by means of the duct 16.

At this point there is obviously a balance between the pressures in the boiler 2 and in the pressurized tank 9, and by actuating the electric valve 5 it is possible to make the required amount of steam flow into the delivery body, for example the iron 6.

It should be noted that the flow of hot water and steam from the boiler 2 to the pressurized tank preheats the water which is present in the tank.

As shown in Figure 3, as steam flows out of the delivery body, the steam drawn from the boiler 2 is replenished by the steam which is present in the pressurized tank 9, flowing from the tank, by means of the duct 16, back into the boiler 2 until a new pressure balance is reached between the boiler and the pressurized tank 9.

Due to the same reason, as water is progressively used up in the boiler 2, and every time the pressure inside the boiler consequently drops below a preset pressure threshold, the one-way valve 8 opens and allows water to flow from the pressurized tank 9 to the boiler 2.

In other words, an amount of steam and water is always available during use of the iron by virtue of the storage of steam and water provided in the pressurized tank 9.

In practice it has been observed that the device for vapor production according to the invention is particularly advantageous in that it allows, for an equal power consumption with respect to a conventional device for vapor production, to reduce to less than one third the time required to produce steam and thus start to use it.

At the same time, in addition to this advantage, the operating endurance of the ironing or cleaning machine is equivalent to, if not higher than, that of conventional ironing or cleaning machines by virtue of the presence, in the pressurized tank 9, of preheated water and steam which are suitable to supply the boiler 2 every time this is necessary.

In practice, the materials employed, as well as the dimensions, may be any according to the requirements and the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

## Claims

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1. High-efficiency device for vapor production, which comprises a boiler (2) provided with a means (3) for heating a selected amount of water in order to form steam, with a means (4) for controlling the forming of said steam and with a means (5) for the controlled dispensing of said steam, by means of flexible hoses (7), to a delivery body characterized in that said boiler (2) is connected to a means (8) for the storage of water and steam for replenishing said water and steam in said boiler (2) in proportion to their consumption by said delivery body.

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2. Device according to claim 1, characterized in that said storage means (8) comprises a pressurized tank (9) which has an opening (11) for introducing water (12) in it and a first duct (15) and a second duct (16) which are connected to said boiler (2).

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3. Device according to claim 2, characterized in that said opening is formed by a pipe (17) which extends inside said pressurized tank (9) by a preset extent in order to prevent its complete filling.

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4. Device according to claim 2, characterized in that said first duct (15) comprises at least one one-way valve (18) to prevent the back of said water from said boiler (2) to said pressurized tank (9).

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5. Device according to claim 2, characterized in that said first duct (15) is arranged below said second duct (16) and is connected to said boiler (2) substantially in a lower portion of its side wall (20).

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6. Device according to claim 1, characterized in that said boiler (2) is smaller than said pressurized tank (9) and in that said second duct (16) is connected to the upper wall (21) of said boiler and extends inside said boiler by a preset extent in order to prevent its complete filling.

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7. Device according to claim 4, characterized in that said one-way valve (18) opens and closes according to the pressure inside said boiler.

5 8. Device to claim 2, characterized in that during the production of said steam the pressure inside said boiler is equivalent to the pressure inside said pressurized tank.

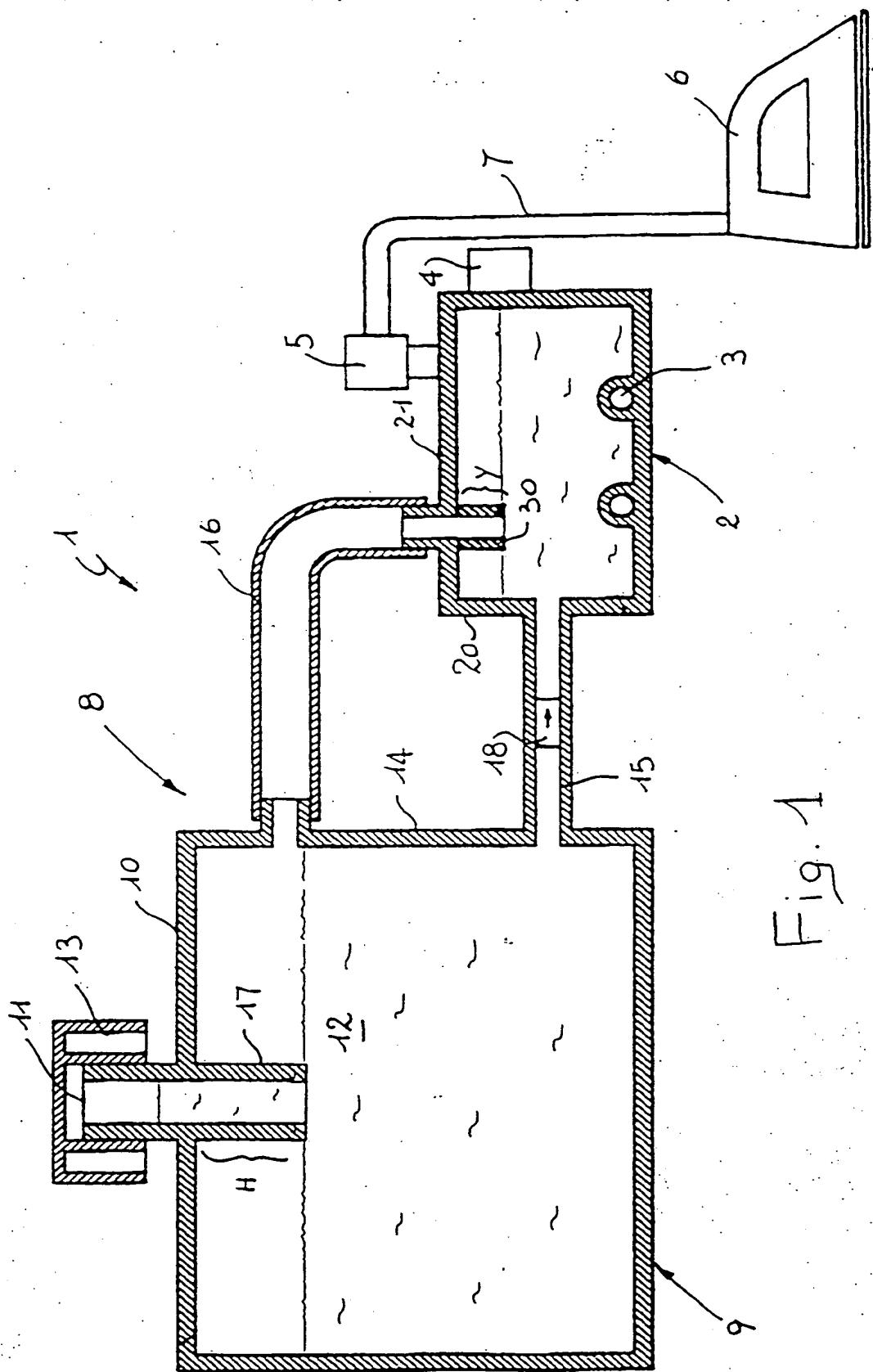


Fig. 1

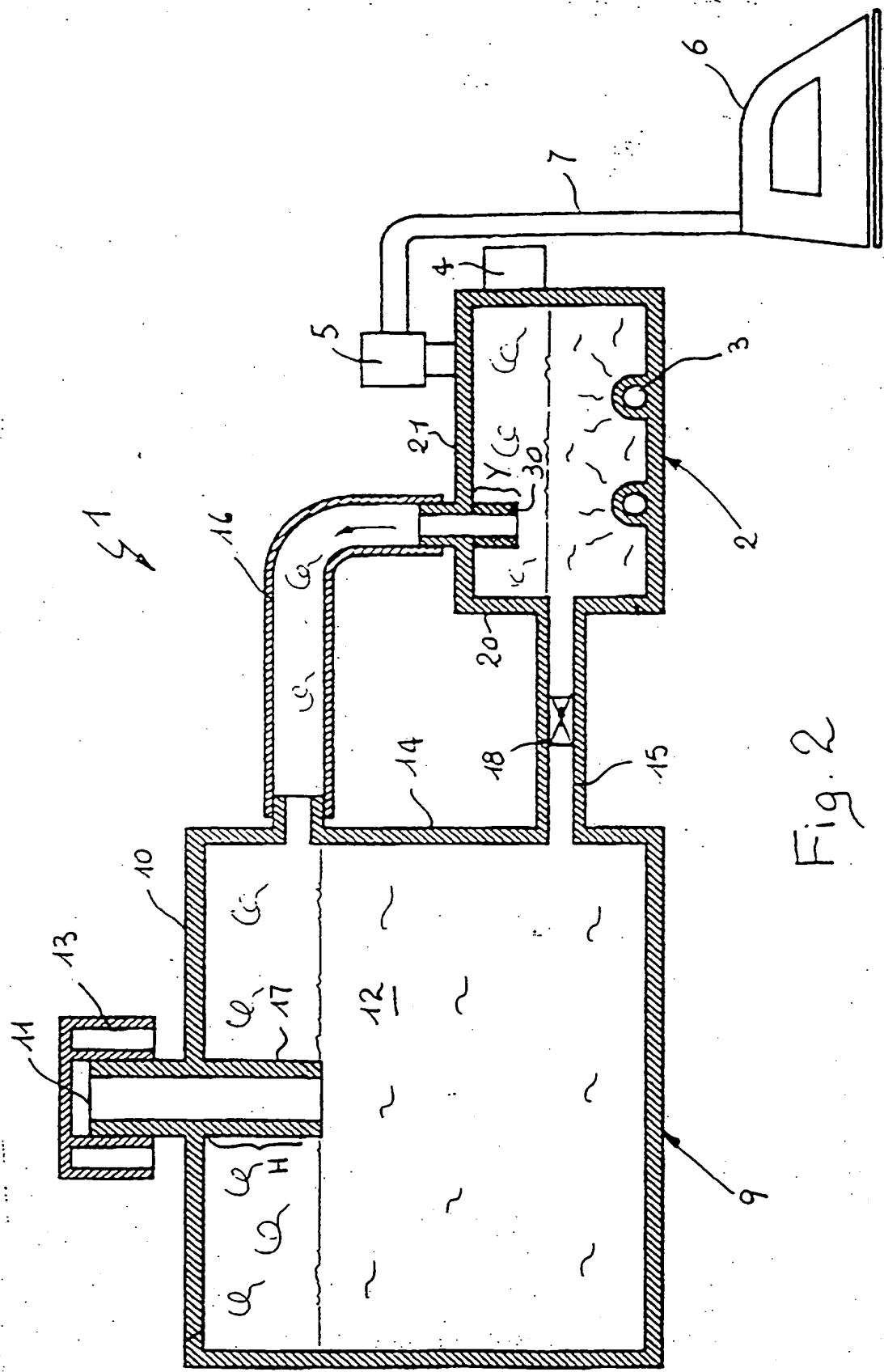


Fig. 2

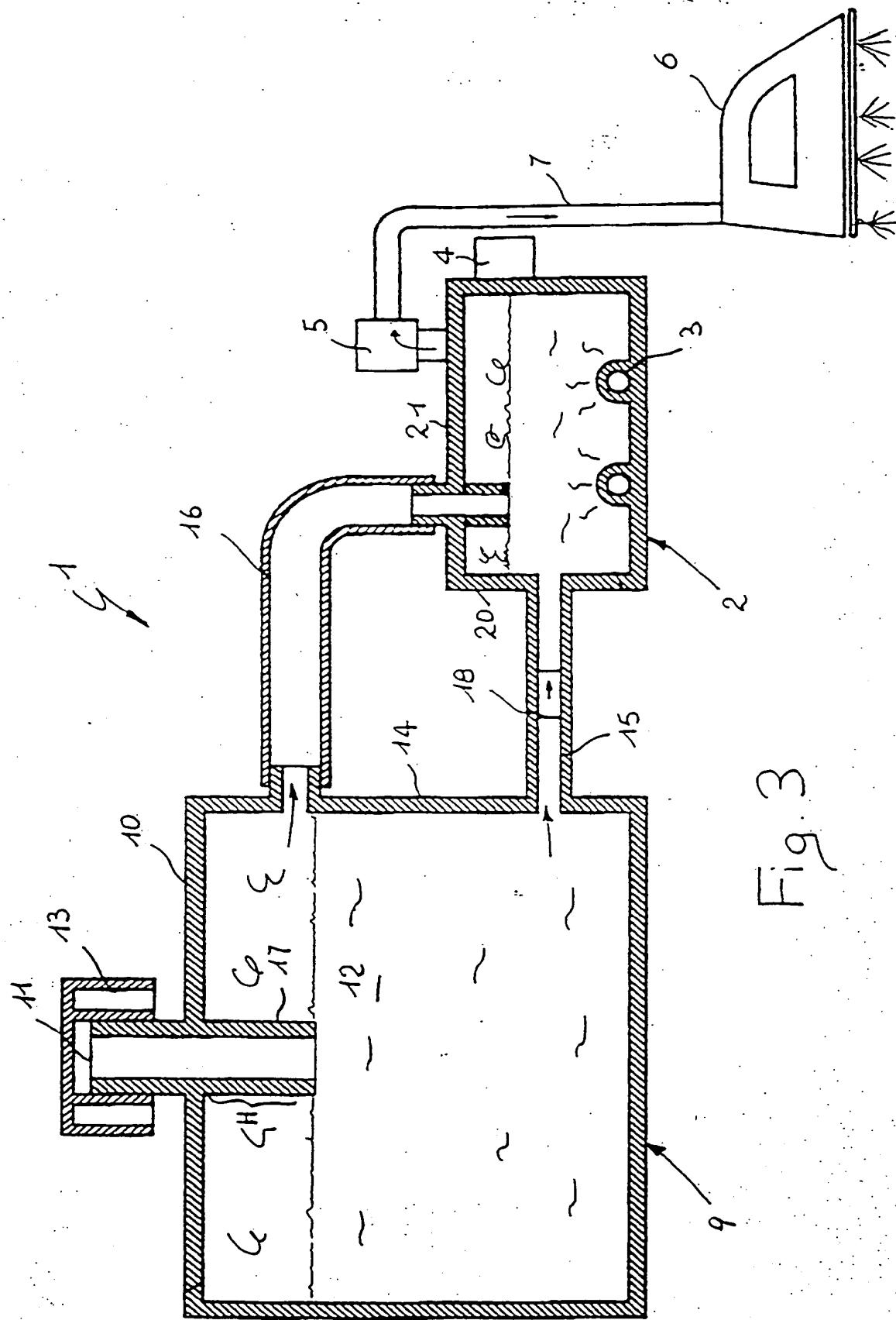


Fig. 3



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## EUROPEAN SEARCH REPORT

Application Number  
EP 93 11 6129

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	GB-A-2 158 210 (NUTT)  * page 2, line 42 - page 3, line 18; figures *	1,2,4,5, 7,8	F22B1/28
X	US-A-1 682 320 (BREWER)  * page 2, line 29 - line 110; figures * * page 3, line 121 - page 4, line 45 *	1,2,5,8	
X	US-A-2 252 541 (ARNOLD)  * page 3, line 28 - line 46; figure 6 *	1,2,5,8	
A	US-A-2 785 271 (BALY)  * column 2, line 28 - line 43; figures * * column 3, line 57 - line 65 *	1,3,6	
A	US-A-3 559 427 (BAKER)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.)
			F22B D06F
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	4 February 1994	Van Gheel, J	
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